NRRC Technical Regulations

Nuclear Material Accountancy and Control

NRRC-R-12 Rev. 0.1

2024

هيئة الرقابة النووية والإشعاعية
Nuclear and Radiological Regulatory Commission

Nuclear Material Accountancy and Control

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Regulation

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Preamble

In accordance with the provisions of the Law of Nuclear and Radiological Control issued by Royal Decree No. (M/82) dated 25/7/1439 AH, and NRRC's Statute issued by the Ministers' Cabinet Resolution No. (334) dated 25/6/1439 AH, the NRRC prepared regulations that ensure control over radiological activities and practices as well as nuclear and radiological facilities.

This regulation has been prepared on the basis of International Atomic Energy Agency (IAEA) standards, international best practices, and in accordance with the Kingdom's international commitments. This regulation has been presented in "the Public Consultation Platform" for the public review, comments, and feedback.

This regulation has been approved by the NRRC's Board of Directors Resolution No. (R/1/1/2022) dated 20/04/2022.

This edition, NRRC-R-12 Rev. 0.1 (2024), of the regulation is revised and takes precedence over the previous publication, NRRC-R-12 (2022). In addition, the changes within this revision are editorial.

Table of Contents

Related Regulations

Chapter 1: Objective, Scope, and Definitions

Section 1: Objective

1. This regulation establishes the regulatory requirements in the Kingdom for the implementation of the national control system for nuclear material for the purpose of nuclear safeguards and control of non-proliferation of nuclear weapons as per the Treaty on the Non-Proliferation of Nuclear Weapons and the Safeguards Agreement through the State System of Accounting for and Control of Nuclear Material (SSAC).

Section 2: Scope

2. This regulation establishes the requirements for the accountancy and control of nuclear material and the provision of information as required by the NRRC.

3. The requirements of this regulation shall apply to the following:

    a. Possession, manufacture, production, transfer, handling, use, storage, transport, import and export of nuclear material;

    b. Ore containing uranium or thorium, as prescribed by the NRRC;

    c. Planning, design, construction, and operation of nuclear facilities or Location Outside Facilities (LOF);

    d. Mining and ore processing operations aimed at producing uranium or thorium;

    e. Nuclear fuel cycle-related research and development activities;

    f. Any other activities related to nuclear material and ore containing uranium or thorium, as determined by the NRRC.

4. The notification and authorization for matters in Article 3 are established in the following NRRC regulations:

a. Notification on and Authorization of Facilities and Activities with Radiation Sources (NRRC-R-02 Rev. 0.1);

b. Licensing and Regulatory Oversight of Nuclear Facilities (NRRC-R-03 Rev. 0.1).

Section 3: Definitions

Accounting record

A set of data kept at each facility or location outside facilities (LOF) showing the quantity of each type of nuclear material present, its distribution within the facility or LOF and any changes affecting it.

Batch

A portion of nuclear material handled as a unit for accounting purposes at a key measurement point (KMP) and for which the composition and quantity are defined by a single set of specifications or measurements. The nuclear material may be in bulk form or contained in several separate items. Items included in the same batch are items containing nuclear material of the same element concentration and enrichment.

Containment and surveillance equipment

Any item authorized for the nuclear material accountancy and control activities which is installed or used by the NRRC or installed with the consent of the NRRC for sampling, measurement or analysis of nuclear material, including radiation detection, containment, surveillance, or monitoring devices.

Design information questionnaire (DIQ)

The nuclear facility design information as per the form prescribed by the NRRC.

Effective kilogram (ekg)

The quantity of effective kilograms is obtained by taking:

a. For plutonium, its weight in kilograms;

b. For uranium with an enrichment of 0.01 (1%) and above, its weight in kilograms multiplied by the square of its enrichment;

c. For uranium with an enrichment below 0.01 (1%) and above 0.005 (0.5%), its weight in kilograms multiplied by 0.0001; and

d. For depleted uranium with an enrichment of 0.005 (0.5%) or below, and for thorium, its weight in kilograms multiplied by 0.00005.

Environmental sampling (ES)

A collection of environmental samples (e.g., air, water, vegetation, soil smears) for the purpose of assisting in drawing relevant conclusions.

Inventory change

An increase or decrease, in terms of batches, of nuclear material in a Material Balance Area (MBA); such a change shall involve one of the following:

a. Increases: import, domestic receipt from other MBAs, nuclear production, accidental gain, retransfer from retained waste, and de-exemption of nuclear material;

b. Decreases: export, domestic shipment to other MBAs, nuclear loss, other loss, measured discard, transfer to retained waste, exemption of nuclear material, and termination of applying Nuclear Material Accountancy and Control (NMAC) on nuclear material transferred to non-nuclear use.

Inventory Change Report (ICR)

An accounting report showing all changes in the inventory of nuclear material in the Material Balance Area during a certain period.

Location Outside Facilities (LOF)

Any installation or location, which is not a nuclear facility, where nuclear material is customarily used in amounts of one effective kilogram or less.

Key Measurement Point (KMP)

A location where nuclear material appears in such a form that it may be measured to determine material flow or inventory. Key measurement points thus include, but are not limited to, the inputs and outputs (including measured discards) and storages in Material Balance Areas.

Material Balance Area (MBA)

An area in or outside a facility such that:

a. The quantity of nuclear material in each transfer into or out of each Material Balance Area can be determined; and

b. The physical inventory of Nuclear Material in each Material Balance Area can be determined, when necessary, in accordance with specified procedures.

Material Balance Report (MBR)

An accounting report showing the material balance based on a physical inventory of nuclear material present in the Material Balance Area during a certain period.

Nuclear Material (for the purpose of this regulation)

Any source or any special fissionable material as defined in the relevant Safeguards Agreement signed by the Kingdom.

Nuclear Material Accountancy and Control (NMAC)

The procedures for accounting for and control of nuclear material that shall be established and maintained by authorized persons at the facility and LOF level to enable measurement and verification of flow and physical inventory of nuclear material.

Nuclear fuel cycle-related research and development (R&D)

Those activities which are specifically related to any process or system development aspect of any of the following: conversion of nuclear material; enrichment of nuclear

material; nuclear fuel fabrication; reactors; critical facilities; reprocessing of nuclear fuel; processing (not including repacking or conditioning not involving the separation of elements, for storage or disposal) of intermediate or high-level waste containing plutonium, high enriched uranium or uranium-233, but do not include activities related to theoretical or basic scientific research or R&D on industrial radioisotope applications, medical, hydrological and agricultural applications, health and environmental effects and improve maintenance.

Operating records

A set of operating data kept at each facility or LOF on the operation of the facility or LOF, in connection with the use or handling of nuclear material.

Physical inventory

The sum of all the measured or derived estimates of batch quantities of nuclear material physically present at a given time within an MBA, obtained in accordance with specified procedures.

Physical Inventory Taking (PIT)

The measurement and other activities necessary to determine and record the quantities of nuclear material in the inventory of an MBA.

Physical Inventory Listing (PIL)

The listing of all batches in a Material Balance Area separately and specifying material identification and batch data for each batch.

Source Material

Uranium containing the mixture of isotopes occurring in nature; uranium depleted in the isotope 235; thorium; any of the foregoing in the form of metal, alloy, chemical compound, or concentrate. The term source material shall not be interpreted as applying to ore or ore residue. However, ore concentrate is considered to be source material.

Special fissionable material

Plutonium-239; uranium-233; uranium enriched in the isotopes 235 or 233; any material containing one or more of the foregoing; and such other fissionable material as specified by the NRRC.

Chapter 2: Notification of Activities

Section 4: General Requirements for Notification

5. The authorized person and any other person intending to carry out any activity shall submit a notification to the NRRC of such intention as early as possible prior to the initiation of the activity, as established by the NRRC.

6. The authorized person and any other person conducting activities shall notify the NRRC of any changes to the activities and their status as established by the NRRC.

7. Nuclear fuel cycle-related research and development activities are subject to notification requirements as required by this regulation.

Chapter 3: Authorized Person Obligations

Section 5: General Obligations

8. The authorized person shall be responsible for implementing all necessary measures to fulfill the requirements of this regulation, no matter the possible delegation of duties to a third party.

9. The authorized person shall submit to the NRRC all information, data, reports, and notifications required by this regulation within the timeline and in a format specified by the NRRC.

10. The authorized person is responsible for the correctness and completeness as well as the timely provision of information to the NRRC.

11. In the implementation of the requirements within this regulation, the authorized person shall ensure that the safety and security of the activity are not compromised.

Section 6: Nuclear Material Accountancy and Control (NMAC) System

12. The authorized person shall establish and maintain a system of nuclear material accounting and control at the facility or LOF, including the supervision of the activities and the implementation of measures as required by this regulation.

13. The authorized person shall propose the strategic points, which are KMP, used to determine the nuclear material flows and inventories in each MBA for approval by the NRRC.

14. The NMAC system shall be designed, operated, maintained, and documented in a way that ensures correctness and completeness.

15. The NMAC system shall be capable of providing up-to-date information on all nuclear material inventories and activities associated with them, including due verification by the NRRC of the accuracy, scope, and consistency of the information provided to the NRRC.

16. The NMAC system shall be able to generate the reports and notifications as required by this regulation.

17. The authorized person shall ensure competency and preparedness to establish and maintain the NMAC system.

18. The authorized person and/or any persons may request an exemption for specific nuclear material from NMAC, subject to approval by the NRRC.

Section 7: Obligations for Facilitating Regulatory Oversight and Inspections

19. The authorized person shall enable, facilitate, and support the NRRC with the following:

a. Providing access to any facility, LOF, or place where such activity is being carried out;

b. Facilitating the collection of samples and the use of radiation detection and measurement devices in the authorized person's premises where the activity is to be conducted;

c. Providing required information and supporting documentation;

d. Facilitating IAEA inspections and surveillance as required by the NRRC;

e. Performing any other act that the NRRC determines as necessary for the purpose of this regulation.

20. The containment and surveillance equipment of the NRRC or installed with the consent of the NRRC shall not be removed, tampered with, exposed to damage, or prevented from operating as intended by any means and shall only be removed with prior approval from the NRRC.

Section 8: Management System

21. The authorized person shall have in place a management system to ensure that relevant managers and personnel, at all levels in the organization, develop and maintain an understanding and proper implementation of their duties in relation to this regulation.

22. The authorized person shall identify training needs for relevant personnel, conduct training, maintain records of the training, and undertake appropriate actions to comply with the requirements of this regulation.

23. The authorized person shall appoint a qualified person, subject to the NRRC approval, to communicate with the NRRC and assure compliance with the requirements made under this regulation.

Section 9: Nuclear Material Accountancy and Control (NMAC) Manual

24. The authorized person shall develop an NMAC manual describing the duties related to nuclear materials, including accountancy and control, reporting, and other obligations on the activities to be carried out, as prescribed by the NRRC.

25. The NMAC manual shall describe comprehensive compliance with the NRRC requirements.

26. The NMAC manual shall include at least the following details:

    a. General description of the authorized activities and facilities;

    b. General description of the authorized person´s NMAC system and the relevant responsibilities;

    c. Work instructions for performing nuclear material accountancy and control measures;

    d. Work instructions for reporting and notification;

    e. Work instructions for performing internal audit, including measures for physical inventory taking (PIT);

    f. Work instructions for facilitating and preparing for inspections and visits;

    g. Work instructions are provided to ensure proper personnel qualifications and training.

27. The NMAC manual shall be submitted for the NRRC approval before the conduct of any activity, as required by the NRRC, and shall be kept up to date at all times.

Section 10: Accounting and Operating Records

28. The authorized person shall keep accounting and operating records for the activity that shall form the basis of the nuclear material bookkeeping and reporting. The records shall be retained as instructed by the NRRC.

29. The accounting records shall set forth the following in respect of each MBA:

    a. All inventory changes, to permit a determination of the book inventory at any time;

    b. All measurement results that are used for the determination of the physical inventory;

    c. All adjustments and corrections that have been made in respect of inventory changes, book inventories, and physical inventories;

    d. The records shall account for uranium, thorium, and plutonium separately in each batch of nuclear material.

30. The operating records shall be set forth, as appropriate, in respect of each MBA:

    a. Those operating data, which are used to establish changes in the quantities and compositing of nuclear material;

    b. The data obtained from the calibration of tanks and instruments and from sampling and analyses, the procedures to control the quality of measurements, and the derived estimates of random and systematic errors;

    c. A description of the sequence of the actions taken in preparing for, and in taking, a physical inventory, to ensure that it is correct and complete;

    d. A description of the actions taken to ascertain the cause and magnitude of any accidental or unmeasured loss that might occur.

Section 11: Protection of Confidential Information

31. The authorized person and any other person shall take every precaution to protect confidential information as required by the Regulation on Information Protection and Cybersecurity (NRRC-R-20).

Chapter 4: Obligations for Provision of Information

Section 12: Design Information Questionnaire (DIQ)

32. The authorized person or any other person shall submit to the NRRC the preliminary design information of the nuclear facility immediately after the decision is taken to construct a nuclear facility and information in respect of LOFs and to update that information as soon as more specific information becomes available.

33. The preliminary design information shall be submitted using the format as specified by the NRRC.

34. The DIQ based on preliminary construction plans for the nuclear facility shall be submitted to the NRRC before construction of the nuclear facility begins, as required by the NRRC.

35. The complete DIQ of the nuclear facility, based on "as-built" designs, shall be submitted to the NRRC before the first consignment of nuclear material is due to be received at the facility, as required by the NRRC.

36. The provided information shall include a map of each site and a general description of each building on the site, including its use and contents.

37. Updates of design information or any change shall be provided as soon as any decision to make the change has been taken.

Section 13: Activity Program

38. The authorized person shall submit the activity program to the NRRC, which shall include at least the anticipated or exact dates and relevant data of the following:

    a. Planned inventory changes;

    b. Physical inventory taking for nuclear facilities and LOFs;

c. Domestic and international transfers of nuclear material and ore containing uranium or thorium;

d. Exploration and mining of ore containing uranium or thorium and ore processing operations aimed at producing uranium or thorium;

e. Nuclear fuel cycle-related research and development;

f. Other necessary information supporting maintaining the SSAC by the NRRC.

39. The authorized person shall inform the NRRC about any changes to the activity program without delay.

Section 14: Accounting Reports

40. The authorized person shall prepare an inventory change report (ICR) for each MBA when an inventory change occurs. The ICRs shall reflect all changes, adjustments, and corrections to the inventory of nuclear material.

41. The authorized person shall draw up a material balance report (MBR) in connection with the PIT for each MBA.

42. The authorized person shall draw up a physical inventory listing (PIL) in connection with the PIT, showing the details of each nuclear material batch separately for each KMP.

43. The accounting reports shall be submitted as required by the NRRC.

Section 15: Special Reports

44. The authorized person shall submit to the NRRC a special report in the event of loss of nuclear material and breach or damage to the containment and surveillance equipment.

45. The authorized person shall notify the NRRC about any other incidents relevant to the implementation of the requirements of this regulation as soon as the

incident has been noticed, and if the NRRC requires, the authorized person shall submit special reports, as required by the NRRC.

Section 16: Annual Report

46. The annual report shall state the nuclear material balances, the list of nuclear material at the end of the year, as well as relevant occurrences and activities during the reporting year.

47. The annual report shall be accompanied by a report on the internal audit of the NMAC system.

Section 17: Information Related to Domestic and International Transfer

48. The authorized person shall submit to the NRRC an activity program pertaining to domestic and international transfers of nuclear material and ore containing uranium or thorium for which the authorized person is liable, as required by the NRRC.

49. The authorized person shall notify the NRRC about imports and exports of nuclear material and ore containing uranium or thorium after the transfer has occurred, as required by the NRRC.

Section 18: Information Related to Ore Containing Uranium or Thorium

50. The authorized person and any other person shall submit general plans, as part of the activity program, for the following activities:

    a. Exploration of ore containing uranium or thorium;

    b. Mining of ore containing uranium or thorium;

    c. Mineral ore processing operations aimed at producing uranium or thorium.

51. The general plans shall specify the location, operational status, current and estimated annual production capacity, and any other information as specified by the NRRC.

Section 19: Information Related to Nuclear Fuel Cycle-Related Research and Development

52. The authorized persons and any other person conducting activities related to the nuclear fuel cycle-related research and development shall:

    a. Provide general plans for the activities as part of the activity program, as required by the NRRC;

    b. Provide the NRRC with a general description and information specifying the location and pertinent details to the nuclear fuel cycle-related research and development activities.

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